



## **HELLBENDER® DAF Pumps**

### INSTALLATION, OPERATING, AND MAINTENANCE INSTRUCTIONS

HB-60, HB-90, HB-150, HB-250



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## **SAFETY RECOMMENDATIONS**

### **GENERAL**

1. Most accidents can be avoided by using common sense.
2. Read the operations and maintenance manual supplied with the pump.
3. Do not wear loose clothing that can become entangled in moving parts.
4. This pump is designed to handle materials which could cause injury, illness, or disease through direct exposure. Wear adequate protective clothing when working on the pump or piping.

### **PUMP**

1. The pump builds up heat and pressure during operation. Allow time for the pump to cool down before handling or servicing.
2. Only qualified and trained personnel should install, operate, and repair the pump.
3. Keep clear of suction and discharge openings. Do not insert fingers into the pump with the power connected.
4. Do not pump flammable materials, or other materials for which the pump was not designed.
5. Do not exceed the manufacturer's recommendations for performance.
6. Do not operate the pump without guards or safety devices in place.
7. For hazardous locations, use pumps that are listed and classified for such locations.
8. Always replace safety devices that have been removed during service or repair.

### **ELECTRICAL**

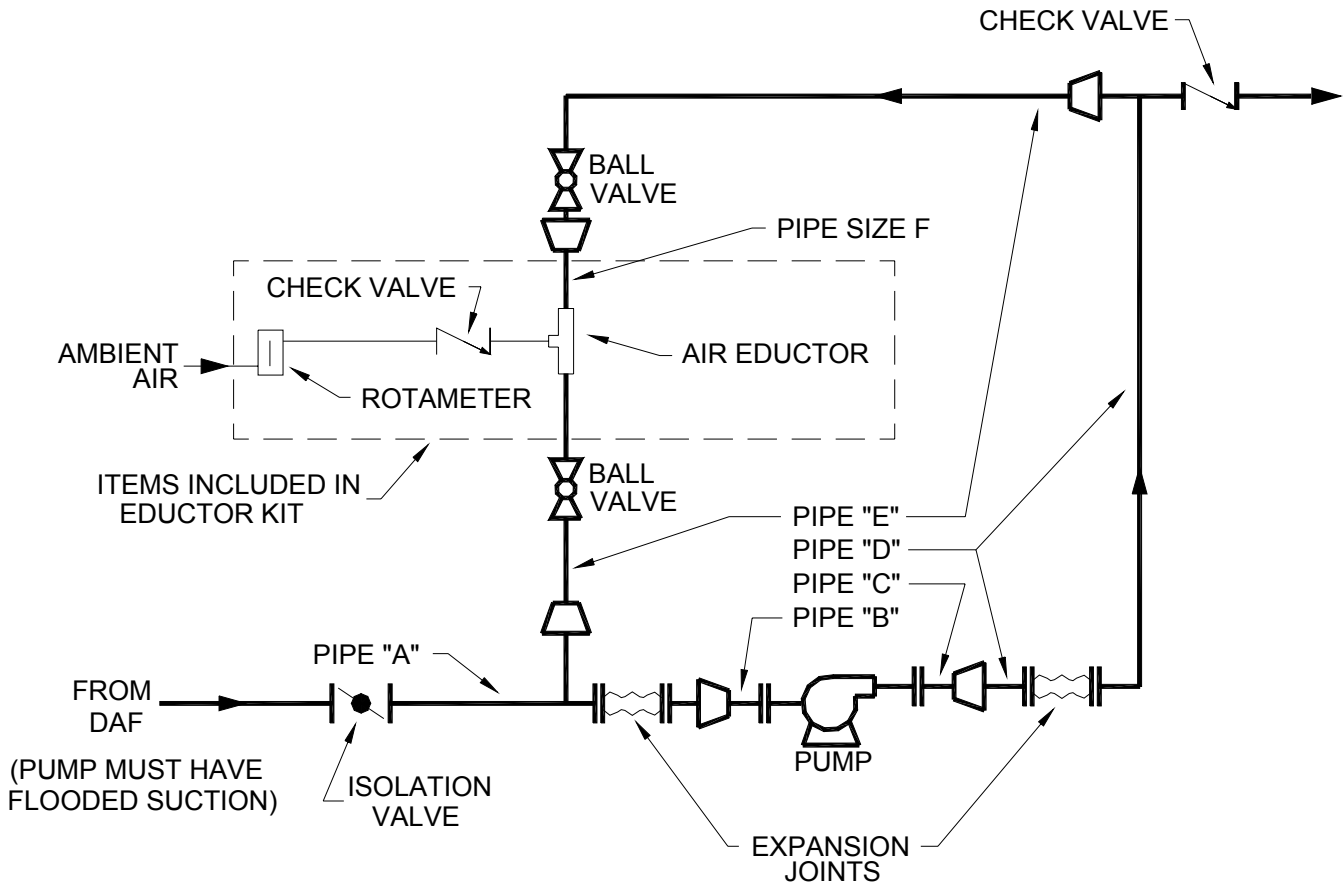
1. To reduce the risk of electric shock, the pump must be properly grounded in accordance with the National Electric Code and all applicable state and local codes and ordinances.
2. To reduce the risk of electrical shock, disconnect the pump from the power source before handling or servicing.
3. Wiring of pumps should be performed by a qualified electrician.

**INSTALLATION**

The line diagrams below show two suggested installation options. The first (Figure 1) uses an eductor loop with ambient or compressed air, while the second (Figure 2) uses regulated compressed air without an eductor loop. Table 1 below the diagrams shows suggested line sizes for each pump size. These line sizes are general guidelines only; the customer must select and/or verify the line sizes needed for each application.

**NOTE: The pump must be installed with flooded suction.**

Figure 1. Suggested Installation WITH an eductor loop



INSTALLATION DIAGRAM - AIR INJECTION WITH AIR EDUCTOR

Figure 2. Suggested Installation WITHOUT an eductor loop

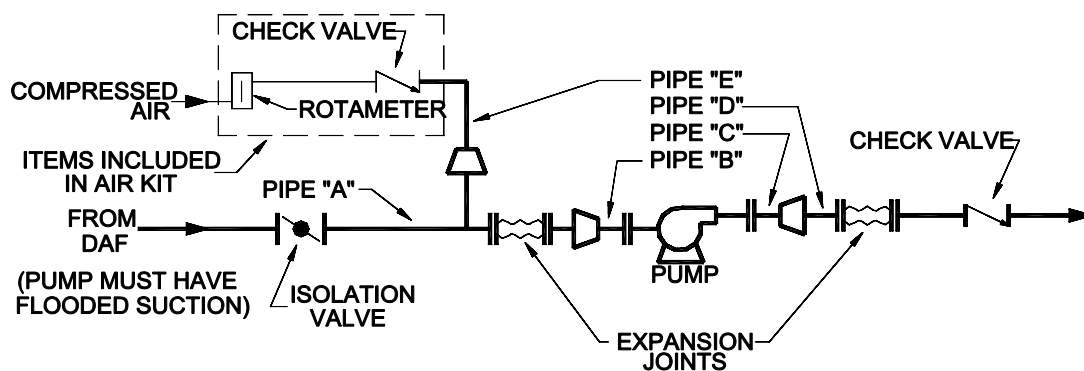
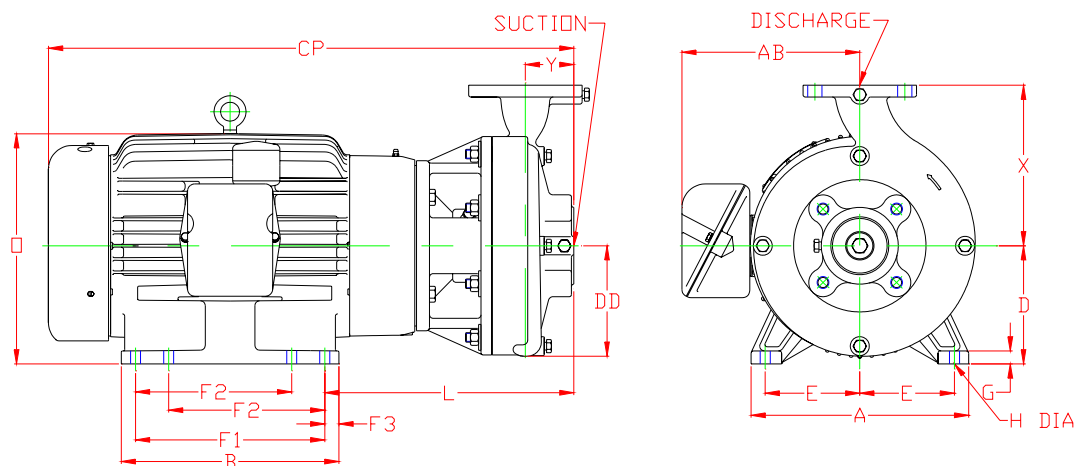
**INSTALLATION DIAGRAM - AIR INJECTION WITHOUT AIR EDUCTOR**

Table 1. Recommended Pipe Sizes

Pipe	HB-60	HB-90	HB-150	HB-250
A	3"	3"	4"	4"
B	2"	2"	2.5"	2.5"
C	1.5"	1.5"	2"	2"
D	2"	3"	3"	4"
E	1"	1"	1"	1.5"
F	1/2"	1/2"	3/4"	1"

Figure 3. Pump Dimensions



## NOTES:

1. ALL DIMENSIONS  $\pm .030$ , UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS SHOWN ARE APPROXIMATE DIMENSIONS FOR STANDARD PUMPS EQUIPPED WITH TEFC MOTORS. DO NOT USE FOR CONSTRUCTION PURPOSES.

Table 2. Pump Dimensions (Note: HB-60 and HB-90 pumps feature FPT connections, not flanges)

PUMP	SUCT	DISC	A	AB	B	CP	D	DD	E	F1	F2	F3	G	H	L	O	X	Y
HBP-60	2	1½	11 1/2	9 13/32	9 3/4	26 3/8	6 1/4	5 25/32	5	8 1/4	N/A	N/A	11/16	17/32	13 1/2	12 3/16	9	3
HBP-90	2	1½	11 1/2	9 13/32	9 3/4	26 3/8	6 1/4	5 25/32	5	8 1/4	N/A	N/A	11/16	17/32	13 1/2	12 3/16	9	3
HBP-150	2½	2	11 1/2	9 13/32	11 1/2	27 3/4	6 1/4	5 27/32	5	10	8 1/4	3/4	11/16	17/32	13 5/32	12 3/16	8 1/2	2 9/16
HBP-250	2½	2	12 3/4	13 1/8	12 7/8	31 1/2	7	5 27/32	5 1/2	11	9 1/2	15/16	7/8	21/32	13 5/32	14 7/16	8 1/2	2 9/16

**OPERATION****Start-up**

1. Before starting the pump, verify that all suction and discharge-side valves are fully open and that any air supply lines, air flow control valves, and eductor loops are fully closed.
2. If starting the pump for the first time, or after the pump has been drained, verify that the pump is primed (i.e., the casing is full of the liquid to be pumped) and that adequate water exists in the DAF to fill the recycle piping.
3. If starting the pump for the first time, or after working on any of the power wiring, “bump” the control power to check the rotation of the pump.
4. Start the pump. As the pump comes to full speed the discharge pressure should rise.
5. Once the pressure has stabilized, increase the pressure on the system to the desired value (the exact method for doing this will depend on the equipment installed).
6. Open the eductor loop valves (if present), keeping the air control valve closed. Readjust the system pressure if needed.
6. Open the air control valve to the desired air flow rate.
7. Readjust the system pressure if needed.

**Shutdown**

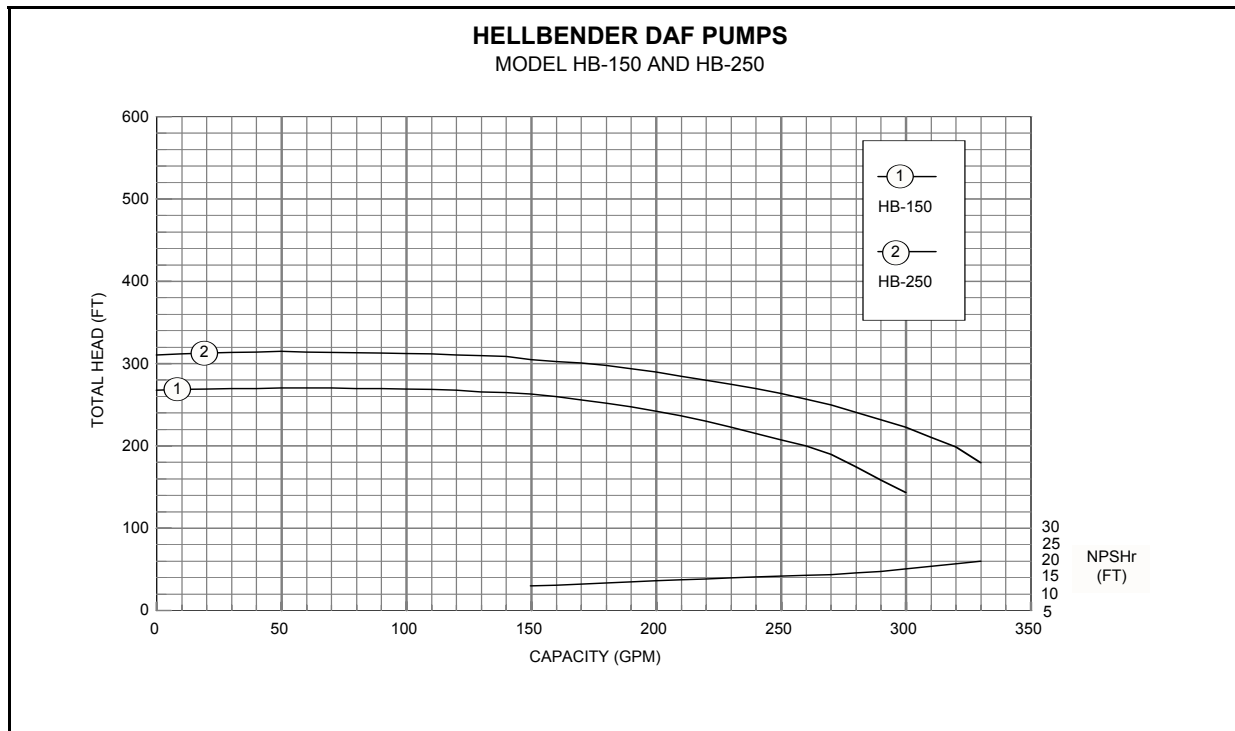
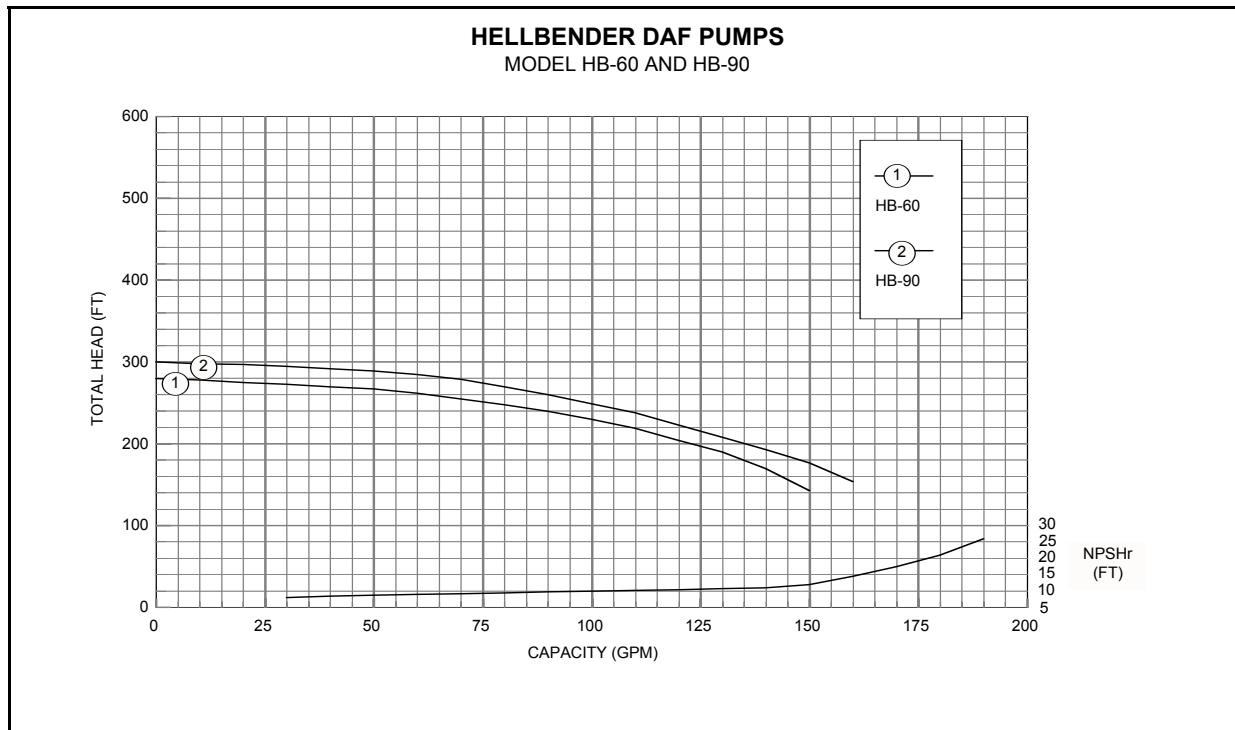
1. Close the air control valve.
2. Fully open all discharge valves.
3. Stop the pump.

**Table 3. Suggested air flow and pressure ranges (for pump installed with eductor as shown in Figure 1)**

<b>Model</b>	<b>Air flow</b>	<b>Pressure at DAF Inlet (Typical)</b>
HB-60	36 - 48 SCFH	90 psig
HB-90	54 - 72 SCFH	90 psig
HB-150	90 - 120 SCFH	90 psig
HB-250	150 - 200 SCFH	90 psig

Note: Pressures at the pump discharge will be higher than pressures at the DAF listed above. The pressure at the pump should never exceed 115 psi. In addition, it is recommended that the user install a 125 psi relief valve to protect the pump.

Figure 4. Pump Curves





**ACCESSORIES**Table 4. Accessory Kit and Eductor Information

	<b>HB-60</b>	<b>HB-90</b>	<b>HB-150</b>	<b>HB-250</b>
<b>Eductor Kit P/N</b>	HB60-EAK	HB90-EAK	HB150-EAK	HB250-EAK
<b>Air Kit P/N</b>	HB60-AAK	HB90-AAK	HB150-AAK	HB250-AAK
<b>Eductor Size</b>	3/4"	3/4"	1"	1.25"
<b>Eductor Intake</b>	1/2" FPT	1/2" FPT	3/4" FPT	1" FPT
<b>Eductor Discharge</b>	3/4" MPT	3/4" MPT	1" MPT	1.25" MPT
<b>Rotameter Range</b>	15-100 SCFH	15-100 SCFH	20-180 SCFH	0.4-4.0 SCFM

## Notes:

1. Eductor kits include a rotameter, eductor, air check valve, and all fittings and tubing (10 ft) required to connect the rotameter to the check valve and the check valve to the eductor.
2. Air kits include a rotameter, air check valve, and all fittings required to connect the rotameter to the check valve. The check valve has a 1/2" FPT discharge for connection by the user to the piping system.

**MAINTENANCE**

Routine maintenance of the pump is not required. Depending on the motor supplied, greasing of the motor may be required. The operator should observe the pump frequently to check for any of the conditions in the Troubleshooting section below.

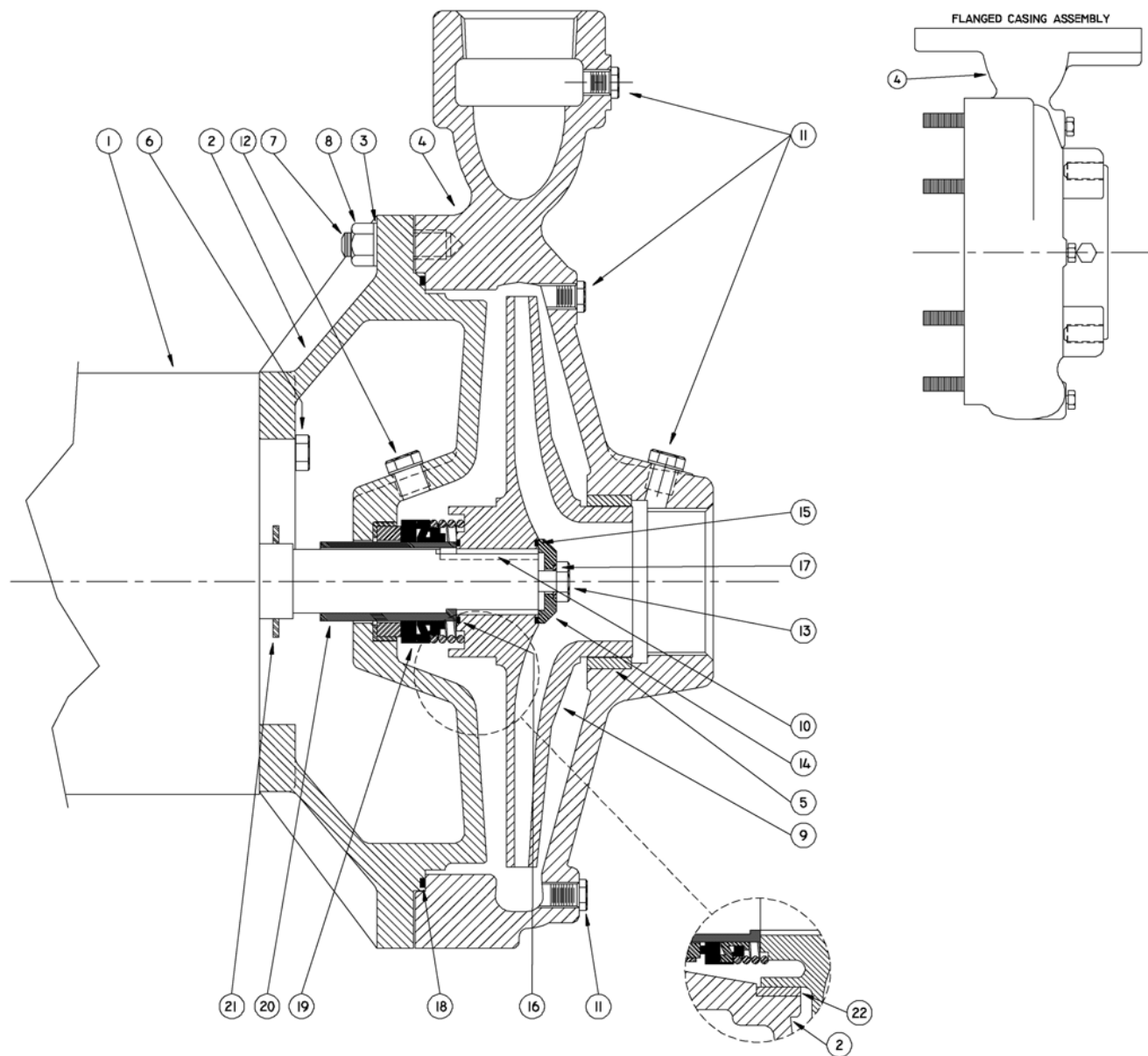
**TROUBLESHOOTING**

<u>PROBLEM</u>	<u>CAUSE</u>	<u>SOLUTION</u>
Pump is not running	Starter or motor is tripped	Investigate cause, correct, and reset
Pump not running in correct direction	Incoming phases reversed	Reverse any two wires at starter or motor
System relief valve operating excessively	System pressure too high	Open valves on discharge side of pump
Gravelly sound in pump	Pump is cavitating	Increase pump discharge pressure to recommended range  Adjust air flow to pump to within recommended range  If using compressed air, reduce incoming air pressure until just high enough to achieve needed air flow  Check for sufficient flow to pump suction
No air flow	Air valve is closed	Open air valve
	Check valve is plugged	Inspect and clean or replace
	Water in air line	Inspect and clean
	Eductor loop is closed	Adjust valves as needed
	Eductor is plugged	Inspect and clean or replace
Insufficient air flow	Compressed air supply is off	Monitor solids in recycle stream, filter if necessary  Check and adjust
	Air valve is closed	Open air valve more
	Rotameter is plugged	Clean or replace

## TROUBLESHOOTING continued

PROBLEM	CAUSE	SOLUTION
	Debris/water in check valve or air line	Clean or replace
	Eductor loop closed	Open valves as needed to increase motive force in eductor loop
Pump is not achieving desired pressure	Not enough restriction on discharge side of pump	Throttle discharge valves
	Pump casing or impeller is worn	Replace or rebuild pump
No whitewater in DAF	No or insufficient air flow	See above
	No forward flow	See above
Large disruptive bubbles in whitewater	Poor air dissolution due to system design	Adjust system design as needed
	Excessive air flow	Reduce air flow to recommended range
Mechanical seal leaking	Normal wear	Adjust or replace
	Seal broken	Determine cause; replace
Water temperature in eductor loop is high	Insufficient forward flow	Adjust eductor loop
		Rebuild or replace pump

Figure 4. Parts Breakout



SYMBOL NUMBER	QUANTITY	DESCRIPTION
1	1	Motor, 15 HP 3500 RPM TEFC, 254JM Frame, for HB-60 & HB-90
	1	Motor, 20 HP 3500 RPM TEFC, 256JM Frame, for HB-150
	1	Motor, 30 HP 3500 RPM TEFC, 286JM Frame, for HB-250
2	1	Adapter - HB-60, HB-90, HB-150, Bronze Fitted Pumps
	1	Adapter - HB-60, HB-90, HB-150, All Bronze Pumps
	1	Adapter - HB-250, Bronze Fitted Pumps
	1	Adapter - HB-250, All Bronze Pumps
3	12	Lockwasher - SS
4 *	1	Casing Assy. - HB-60, HB-90 Bronze Fitted Pumps
	1	Casing Assy. - HB-60, HB-90 All Bronze Pumps
	1	Casing Assy. - HB-150, HB-250, Bronze Fitted Pumps
	1	Casing Assy. - HB-150, HB-250, All Bronze Pumps
	1	Casing Assy. - HB-150, HB-250 (Flanged), Bronze Fitted Pumps
	1	Casing Assy. - HB-150, HB-250 (Flanged), All Bronze Pumps
5 *	1	Casing Wear Ring, Bronze - HB-60, HB-90
	1	Casing Wear Ring, Bronze - HB-150, HB-250
6	4	Capscrew - HB-60, HB-90, HB-150 Bronze Fitted Pumps
	4	Capscrew - HB-60, HB-90, HB-150 All Bronze Pumps
	4	Capscrew - HB-250
7 *	12	Stud
8	12	Nut
9	1	Impeller - HB-60
	1	Impeller - HB-90
	1	Impeller - HB-150
	1	Impeller - HB-250
10	1	Key
11 *	6	Plug, 1/8" Pipe - Bronze
12	1	Plug, 1/4" Pipe - Bronze

\* Casing Assy. Includes Symbols 5, 7, and 11

\*\* For hot water or caustic service.

+ Standard HB pumps are supplied with Buna N O-ring type gaskets.

SYMBOL NUMBER	QUANTITY	DESCRIPTION
13	1	Capscrew , SS - For Bronze Fitted Pumps
	1	Capscrew , Bronze - For All Bronze Pumps
14	1	Washer - Bronze
15 +	1	Flat Gasket
	1	O-Ring Gasket - Buna N (Std.)
	1	O-Ring Gasket - Viton
	1	O-Ring Gasket - EPT **
	1	O-Ring Gasket - Teflon
16 +	1	Flat Gasket
	1	O-Ring Gasket - Buna N (Std.)
	1	O-Ring Gasket - Viton
	1	O-Ring Gasket - EPT **
	1	O-Ring Gasket - Teflon
17 +	1	O-Ring Gasket - Buna N (Std.)
	1	O-Ring Gasket - Viton
	1	O-Ring Gasket - EPT **
	1	O-Ring Gasket - Teflon
18 +	1	Flat Gasket
	1	O-Ring Gasket - Buna N (Std.)
	1	O-Ring Gasket - Viton
	1	O-Ring Gasket - EPT **
	1	O-Ring Gasket - Teflon
19 +	1	Mechanical Seal - Buna N (Std.)
	1	Mechanical Seal - Viton
	1	Mechanical Seal - EPT **
20	1	Shaft Sleeve, Bronze
21	1	Slinger Washer

## TERMS AND CONDITIONS OF SALE HELLBENDER DAF PUMPS

**OUR ACCEPTANCE OF YOUR ORDER IS EXPRESSLY CONDITIONED ON THE GENERAL TERMS AND CONDITIONS SET FORTH BELOW AND ALL TERMS STATED ON THE FACE OF THIS FORM. THE CONTRACT SHALL NOT INCLUDE ANY DEVIATING OR ADDITIONAL TERMS UNLESS EXPRESSLY AGREED TO IN WRITING AND SIGNED BY AN OFFICER OF OUR COMPANY.**

**PRICES:** All prices are subject to change without notice, and all shipments will be invoiced at the price in effect at the time of shipment, except when otherwise agreed to in writing by our authorized representative. Published prices are for products of our standard design and construction, and any item not covered by the most recent published price list must be referred to us for special pricing. Prices do not include freight. Any weights given in product literature are approximate shipping weights. The amount of any applicable present or future tax or other government charge upon the production, sale, shipment, or use of goods ordered or sold is not included in the price and will be added to billing unless you provide us with an appropriate exemption certificate.

**QUOTATIONS:** Prices quoted by us are valid for 30 days from the date of quotation unless we have otherwise specified in writing. Clerical errors on quotations are subject to our correction, and such errors will not be binding.

**CANCELLATION AND REVISIONS:** No purchase orders accepted and acknowledged by us may canceled or revised by you except with our prior written consent and upon payment of reasonable cancellation charges compensating us for all cost incurred in work done and material purchased. We reserve the right to determine what constitutes reasonable cancellation charges.

**RETURN OF EQUIPMENT:** No equipment shall be returned to us without first obtaining a written Returned Goods Authorization and shipping instructions from us. The returner must prepay the charges in full for transportation to our facility. Credit allowed for new, undamaged equipment of current standard design will be 80% of the invoiced price or the current billing price, whichever is less. Equipment which has been used, however slightly, will not be accepted. Authorization will not be given for return of equipment (1) which would, in our opinion, result in an excess in the amount of stock we normally carry, (2) not invoiced within the last 12 months, or (3) which is non-standard and manufactured specifically to a buyer's specifications. For non-standard equipment not of our manufacture, the only credit allowed will be such credit as may be allowed by the manufacturer of such equipment. Equipment must be returned within 30 days of issuance of the Returned Goods Authorization. No item with a net value of less than \$35.00 will be authorized for return. Unauthorized returns may be refused and/or returned freight collect.

**CREDIT AND PAYMENT:** Payment is due as noted on our invoice. Overdue accounts are subject to a service charge. All orders are subject to approval of our Credit Department, and we may require full or partial payment in advance. *Pro rata* payments shall become due as shipments are made. If the shipments are delayed by you for any cause, payments shall become due from the date on which we are prepared to make shipment, and storage shall be at your risk and expense. If manufacture is delayed by you for any cause, a partial payment based upon the proportion of the order completed shall become due from the date on which we are notified of the delay.

**SECURITY INTEREST:** We shall have a lien on all goods sold as security for payment on the invoice price, and upon request you shall provide and execute a financing statement showing such a lien.

**DELIVERY:** We will make reasonable effort to meet your delivery requirement, provided that you provide us, on a timely basis, with all approvals, technical data, instructions, and credit approval requirements needed for release of the shipment. However, all delivery and/or shipment dates are estimates only unless we have expressly guaranteed delivery of such dates in writing at your specific request. In no event shall we have any liability if delivery is delayed by strikes, labor disturbances, material shortages, plant calamities or disaster, acts of God, government actions, civil disturbance, the failure of any pre-supposed condition of the contract, withholding shipments due to credit clearance, or other interferences beyond our reasonable control, and the date of delivery shall be extended for a period of time equal to the time lost because of any such reason.

**SHIPPING:** Unless you specify in writing and we acknowledge in writing, (A) goods will be boxed or crated as we may deem proper for protection against normal handling and for domestic shipment, and (B) routing and manner of shipment will be at our discretion, and may be insured at your expense. An extra charge will be made for special handling. All shipments are F.O.B. our facility, freight prepaid and added, unless otherwise stated. Delivery of goods to the initial carrier will constitute delivery to you, and all goods will be shipped at your risk. A claim for loss or damage in transit must be entered with the carrier and prosecuted by you. Acceptance of material from a common carrier constitutes a waiver of any claims against us for delay, damage, or loss.

**GOVERNING LAW:** It is understood that these Terms and Conditions of Sale shall be interpreted under and pursuant to the laws of the State of Georgia. You agree that any action at law or suit which is related to any contract of sale brought against us shall be filed in a federal or state court located in the State of Georgia.

**LIMITED WARRANTY:**

**Materials and Workmanship:** We warrant to our immediate customer and to the ultimate consumer that products of our manufacture will be free of defects in material and workmanship under normal use and service for the following time period, when installed and maintained in accordance with our instructions:

**Pump Products:** One (1) year from date of installation or twenty-four (24) months from date of shipment, whichever occurs first.

As used herein, "the ultimate consumer" is defined as the purchaser who first uses the product after its initial installation or, in the case of product designed for nonpermanent installation, the first owner who used the product. It is the purchaser's or any sub-vendee's obligation to make known to the ultimate consumer the terms and conditions of this warranty. This warranty gives you specific legal rights, and there may also be other rights which vary from state to state. In event the product is covered by the Federal Consumer Product Warranties Law, (1) the duration of any implied warranties associated with the product by virtue of said law is limited to the same duration as stated herein, (2) this warranty is a LIMITED WARRANTY, and (3) no claims of any nature whatsoever shall be made against us, until the ultimate consumer, his successor, or assigns, notifies us in writing of the defect, and delivers the product and/or defective part(s) freight prepaid to our facility or authorized repair station. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply.

THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY AND ALL WARRANTIES WITH RESPECT TO ANY PRODUCT SHALL BE TO REPLACE OR REPAIR AT OUR ELECTION, F.O.B. OUR FACILITY OR AUTHORIZED REPAIR STATION, SUCH PRODUCTS AND/OR PARTS AS PROVEN DEFECTIVE. THERE SHALL BE NO FURTHER LIABILITY, WHETHER BASED ON WARRANTY, NEGLIGENCE, OR OTHERWISE.

Unless expressly stated otherwise, guarantees in the nature of performance specifications furnished in addition to the foregoing material and workmanship warranties on a product manufactured by us, if any, are subject to laboratory tests corrected for field performance. Any additional guarantees in the nature of performance specifications must be in writing, and such writing must be signed by our authorized representative. Due to inaccuracies in field testing, if a conflict arises between the results of field testing conducted by or for user, and laboratory tests corrected for field performance, the latter shall control. Components or accessories supplied by us but manufactured by others are warranted only to the extent of and by the terms and conditions of the original manufacturer's warranty.

This warranty shall not apply when damage is caused by (a) improper installation, (b) improper voltage, (c) lightning, (d) sand or other abrasive material, or (e) scale or corrosion build-up due to excessive chemical content. Any modification of the original equipment will also void the warranty. We will not be responsible for loss, damage, or labor cost due to interruption of service caused by defective parts. Neither will we accept charges incurred by others without our prior written approval. This warranty is void if our inspection reveals that the product was used in a manner inconsistent with normal industry practice and/or our specific recommendations. The purchaser is responsible for communication of all necessary information regarding the application and use of the product.

UNDER NO CIRCUMSTANCES WILL WE BE RESPONSIBLE FOR ANY OTHER DIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, LOST INCOME, LABOR CHARGES, DELAYS IN PRODUCTION, IDLE PRODUCTION, WHICH DAMAGES ARE CAUSED BY ANY DEFECTS IN MATERIAL AND/OR WORKMANSHIP AND/OR DAMAGE OR DELAYS IN SHIPMENT. THIS WARRANTY IS EXPRESSLY IN

LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTY, INCLUDING ANY WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

No rights extended under this warranty shall be assigned to any other person, whether by operation of law or otherwise, without our prior written approval.

If any litigation is commenced between the parties hereto for the enforcement of any rights hereunder, the successful party in subject litigation shall be entitled to receive from the unsuccessful party all costs incurred in connection therewith, including a reasonable amount for attorney's fees.

**YOUR ACCEPTANCE OF ANY GOODS SUPPLIED BY US, OR ON OUR BEHALF, SHALL WITHOUT LIMITATION CONSTITUTE ACCEPTANCE OF ALL TERMS AND CONDITIONS STATED ABOVE.**